Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Original) A method for characterizing specimen structure from diffusion anisotropy in magnetic resonance imaging without invoking the diffusion tensor formalism, comprising : collecting a plurality of high-angle resolution diffusion image data employing a diffusion-weighted stimulated echo spiral acquisition process; computing spherical diffusion variance in each voxel by a spherical harmonic transform of the diffusion data; identifying components in a plurality of compartments in the voxel, comprising at least three separate diffusion channels, wherein the diffusion channels are apportioned into direct sum subspaces representing isotropic, single fiber, and multiple fiber components, and wherein asymmetries produced by experimental artifacts fall into other undelineated channels impossible to reach by diffusion, thereby, providing direct means of noise reduction within said diffusion channels, and means for identifying artifactual effects; and determining magnitude and direction of diffusion by computing from the spherical harmonic transform magnitude and phase.

2. (Original) A method for characterizing multi-component magnetic resonance images of multidirectional crossed fibers in

a specimen, comprising: obtaining a plurality of high angular diffusion-weighted image signals, each image obtained by applying a diffusion gradient pulse; employing a simple spherical harmonic transform algorithm to identify diffusion anisotropy based upon the variance of the estimated apparent diffusion coefficients as a function of measurement direction; and constructing computerized images of components within a voxel to determine magnitude and alignment of fibers.

3. (Original) A method as described in claim 2, wherein the diffusion gradient pulsing is in an icosahedron pattern.

4. (Currently Amended) A method as described in claim **[[4]]** 3, wherein[[.]] the icosahedron **pattern** is obtained by a plurality of high angle tessellations upon a spherical representation of a specimen.

5. (Original) A method as described in claim 2, wherein the specimen is white matter in the mammalian body.

6. (Original) A method for analyzing diffusion data collected with magnetic resonance imaging of a specimen, comprising: applying a mathematical group theory to analyze spherical diffusion variance in diffusion-weighted image data collected, wherein said data are applied to a spherical harmonic transform; reducing data collected to a numerical algorithm, wherein the algorithm is easily implemented to characterize anisotropy in multifiber systems; identifying components in a voxel as isotropic, single fiber, or multiple fiber structures

forming a plurality of at least three separate channels ; and determining magnitude and direction of diffusion by computation from the transform magnitude and phase.

7. (Original) A spherical harmonic transform algorithm useful in characterizing diffusion anisotropy from signals collected by employing high-angle resolution magnetic resonance imaging, said transform derived from mathematical group theory based on symmetrical conformity.

8. (Original) A spherical harmonic transform algorithm as described in claim 7, wherein said algorithm is useful in the characterizing by determining the composition of a voxel in terms isotropic, single fiber, and multiple fiber channels.

9. (Original) A spherical harmonic transform algorithm as described in claim 8, wherein said algorithm is further useful in determining magnitude and orientation of a diffusion field.

10. (Original) A spherical harmonic transform algorithm as described in claim 8, wherein said algorithm is useful in determining the composition and orientation of fibers in white matter.

11. (Original) A computer program of a spherical harmonic transform algorithm useful in characterizing diffusion anisotropy from signals collected by employing high-angle resolution magnetic resonance imaging, said transform derived from mathematical group theory based on symmetrical conformity.

12. (Original) A method for analyzing magnetic resonance imaging (MRI) data, comprising:

representing MRI diffusion data of a body part as a summation of spherical harmonic functions; and

separating terms of the spherical harmonic functions to represent different diffusion effects including information on anisotropy in diffusion embedded in the MRI data while suppressing noise in extracted diffusion data contributed from non-diffusion effects.

13. (Original) The method as in claim 12, further comprising using coefficients of even-rank spherical harmonic functions to extract information on anisotropic diffusion effects within a voxel.

14. (Currently Amended) The method as in claim 13, wherein a single-fiber diffusion effect is described by

~~$\sum_{l=0.2} a_{lm} Y_l^m(\Omega)$~~

$$\underline{\sum_{l=0,2} \mathrm{a}_{\mathrm{lm}} Y_l^m(\Omega)}$$

where l is the rank of the spherical harmonic function $Y^m_l(\Omega)$ and each of a_{lm} is a coefficient determined by a spherical harmonic transformation of a diffusion tensor associated with the MRI data.

15. (Original) The method as in claim 13, wherein a multiple-fiber diffusion effect is described by

$$\sum_{l=0,2,4}\sum_{m=-l}\sum_{m=-l}^{+l} a_{lm}Y_l^m(\Omega)$$

where l is the rank of the spherical harmonic function $Y^m{}_l(\Omega)$ and each of a_{lm} is a coefficient determined by a spherical harmonic transformation of a diffusion tensor associated with the MRI data.

16. (Original) The method as in claim 13, wherein a sum of spherical harmonic functions of even orders

$$\sum_{l=0,2,4,\ldots}\sum_{m=-l}\sum_{m=-l}^{+l} a_{lm}Y_l^m(\Omega)$$

is used to describe local diffusion effects in the MRI data, where l is the rank of the spherical harmonic function $Y^m{}_l(\Omega)$ and each of a_{lm} is a coefficient determined by a spherical harmonic transformation of a diffusion tensor associated with the MRI data.

17. (Original) The method as in claim 13, further comprising using coefficients of odd-rank spherical harmonic functions to extract information on MRI artifacts.

18. (Original) A method for analyzing magnetic resonance imaging (MRI) data, comprising:

representing MRI data of a body part as a summation of spherical harmonic functions in three dimensions relative to unknown principal axes of diffusion in the body part; and

separating terms of the spherical harmonic functions to represent isotropic diffusion by a coefficient of a spherical harmonic function of a rank of zero and anisotropic diffusion effects by coefficients of even-rank spherical harmonic functions embedded in the MRI data.

19. (Original) The method as in claim 18, further comprising using coefficients of odd-rank spherical harmonic functions to extract information on MRI artifacts.

20. (Original) The method as in claim 18, further comprising using coefficients of even-rank spherical harmonic functions to compute a relative anisotropy index (RA) and a fractional anisotropy index (FA).

21. (Original) A method for processing MRI data, comprising:

constructing MRI images from high angular resolution diffusion data;

using gradient directions to determine measurement angles and spherical Voronoi areas in the MRI images;

computing spherical harmonic functions at specified gradient angles and integration measures from the spherical Voronoi areas;

computing a spherical harmonic transform for each voxel; and using coefficients of the spherical harmonic transform to extract information on diffusion anisotropy.